

**CLAIMS**

What is claimed is:

- 1           1.     An apparatus, comprising:  
2                 a set in an n-way cache to have a max-age value;  
3                 a cache line in said set with an age; and  
4                 a max-age predictor to determine whether said cache line is  
5 referenced fewer times than a threshold value, and if so then to select  
6 said cache line for replacement.
- 1           2.     The apparatus of claim 1, wherein said age is greater than  
2 said max-age value.
- 1           3.     The apparatus of claim 1, wherein max-age predictor has a  
2 counter associated with said cache line.
- 1           4.     The apparatus of claim 3, wherein said counter is  
2 saturating.
- 1           5.     The apparatus of claim 3, wherein said counter decrements  
2 when said cache line is loaded.
- 1           6.     The apparatus of claim 3, wherein said counter increments  
2 when said cache line is referenced.
- 1           7.     An apparatus, comprising:  
2                 a first cache to hold a first cache line; and  
3                 a correlating prefetcher to prefetch a second cache line from a  
4 second cache when said correlating prefetcher determines that said  
5 second cache line is correlated with said first cache line.

1           8.     The apparatus of claim 7, wherein said second cache is to  
2     store a plurality of intra-set links and said first cache is to store a copy  
3     of one of said plurality of intra-set links.

1           9.     The apparatus of claim 8, wherein said correlating  
2     prefetcher determines that said second cache line is correlated with said  
3     first cache line when said copy of one of said plurality of intra-set links  
4     points at said second cache line.

1           10.    The apparatus of claim 8, wherein said copy of one of said  
2     plurality of intra-set links is loaded into said first cache with said first  
3     cache line.

1           11.    The apparatus of claim 7, wherein said second cache is to  
2     store a plurality of least-recently-used bits and said first cache is to  
3     store an age link derived from said plurality of least-recently-used bits.

1           12.    The apparatus of claim 11, wherein said correlating  
2     prefetcher determines that said second cache line is correlated with said  
3     first cache line when said age link points at said second cache line.

1           13.    A method, comprising:  
2         setting a max-age value;  
3         determining whether a cache line is likely to be referenced beyond  
4         said max-age value; and  
5         selecting said cache line for replacement when said determining  
6         finds that said cache line is not likely to be referenced beyond said max-  
7         age value.

1           14.    The method of claim 13, wherein said determining includes  
2     comparing a value of a counter for said cache line to a prediction  
3     threshold.

1           15. The method of claim 14, wherein said counter is  
2 incremented when said cache line is referenced at an age greater than  
3 said max-age value.

1           16. A method, comprising:  
2 determining whether a correlation exists between a first cache  
3 line and a second cache line in a second cache;  
4 loading said first cache line into a first cache; and  
5 prefetching said second cache line to said first cache when said  
6 correlation exists.

1           17. The method of claim 16, wherein said determining includes  
2 preparing intra-set links in said second cache and transferring one of  
3 said intra-set links with said first cache line when said first cache line  
4 is loaded in said first cache.

1           18. The method of claim 17, wherein said determining further  
2 includes prefetching said second cache line when said one of said intra-  
3 set links demonstrates said second cache line is correlated with said  
4 first cache line.

1           19. The method of claim 16, wherein said determining includes  
2 preparing least-recently-used bits in said second cache and coupling an  
3 age link based upon said least-recently-used bits with said first cache  
4 line in said first cache.

1           20. The method of claim 19, wherein said determining further  
2 includes prefetching said second cache line when said age link  
3 demonstrates said second cache line is correlated with said first cache  
4 line.

1           21. An apparatus, comprising:  
2           means for setting a max-age value;  
3           means for determining whether a cache line is likely to be  
4 referenced beyond said max-age value; and  
5           means for selecting said cache line for replacement when said  
6 determining finds that said cache line is not likely to be referenced  
7 beyond said max-age value.

1           22. The apparatus of claim 21, wherein said means for  
2 determining includes means for comparing a value of a counter for said  
3 cache line to a prediction threshold.

1           23. The apparatus of claim 22, wherein said counter is  
2 incremented when said cache line is referenced at an age greater than  
3 said max-age value.

1           24. An apparatus, comprising:  
2           means for determining whether a correlation exists between a  
3 first cache line and a second cache line in a second cache;  
4           loading said first cache line into a first cache; and  
5           prefetching said second cache line to said first cache when said  
6 correlation exists.

1           25. The apparatus of claim 24, wherein said means for  
2 determining includes means for preparing intra-set links in said second  
3 cache and means for transferring one of said intra-set links with said  
4 first cache line when said first cache line is loaded in said first cache.

1           26. The apparatus of claim 25, wherein said means for  
2 determining further includes means for prefetching said second cache  
3 line when said one of said intra-set links demonstrates said second  
4 cache line is correlated with said first cache line.

1           27. The apparatus of claim 24, wherein said means for  
2 determining includes means for preparing least-recently-used bits in  
3 said second cache and means for coupling an age link based upon said  
4 least-recently-used bits with said first cache line in said first cache.

1           28. The method of claim 27, wherein said means for  
2 determining further includes means for prefetching said second cache  
3 line when said age link demonstrates said second cache line is  
4 correlated with said first cache line.

1           29. A system, comprising:  
2 a processor including a set in an n-way cache to have a max-age  
3 value, a cache line in said set with an age, and a max-age predictor to  
4 determine whether said cache line is referenced fewer times than a  
5 threshold value, and if so then to select said cache line for replacement;  
6 a bus to couple said processor to memory and to input/output  
7 devices; and  
8 an audio input/output module.

1           30. The system of claim 29, wherein said age is greater than  
2 said max-age value.

1           31. The system of claim 29, wherein max-age predictor has a  
2 counter associated with said cache line.

1           32. The system of claim 31, wherein said counter increments  
2 when said cache line is referenced.

1           33. A system, comprising:  
2           a processor including a first cache to hold a first cache line, and a  
3 correlating prefetcher to prefetch a second cache line from a second  
4 cache when said correlating prefetcher determines that said second  
5 cache line is correlated with said first cache line;  
6           a bus to couple said processor to memory and to input/output  
7 devices; and  
8           an audio input/output module.

1           34. The system of claim 33, wherein said second cache is  
2 coupled to said processor and is to store a plurality of intra-set links,  
3 and said first cache is to store a copy of one of said plurality of intra-set  
4 links.

1           35. The system of claim 34, wherein said correlating prefetcher  
2 determines that said second cache line is correlated with said first  
3 cache line when said copy of one of said plurality of intra-set links  
4 points at said second cache line.

1           36. The system of claim 35, wherein said copy of one of said  
2 plurality of intra-set links is loaded into said first cache with said first  
3 cache line.

1           37. The system of claim 33, wherein said second cache is  
2 coupled to said processor and is to store a plurality of least-recently-  
3 used bits, and said first cache is to store an age link derived from said  
4 plurality of least-recently-used bits.

1           38. The system of claim 37, wherein said correlating prefetcher  
2 determines that said second cache line is correlated with said first  
3 cache line when said age link points at said second cache line.